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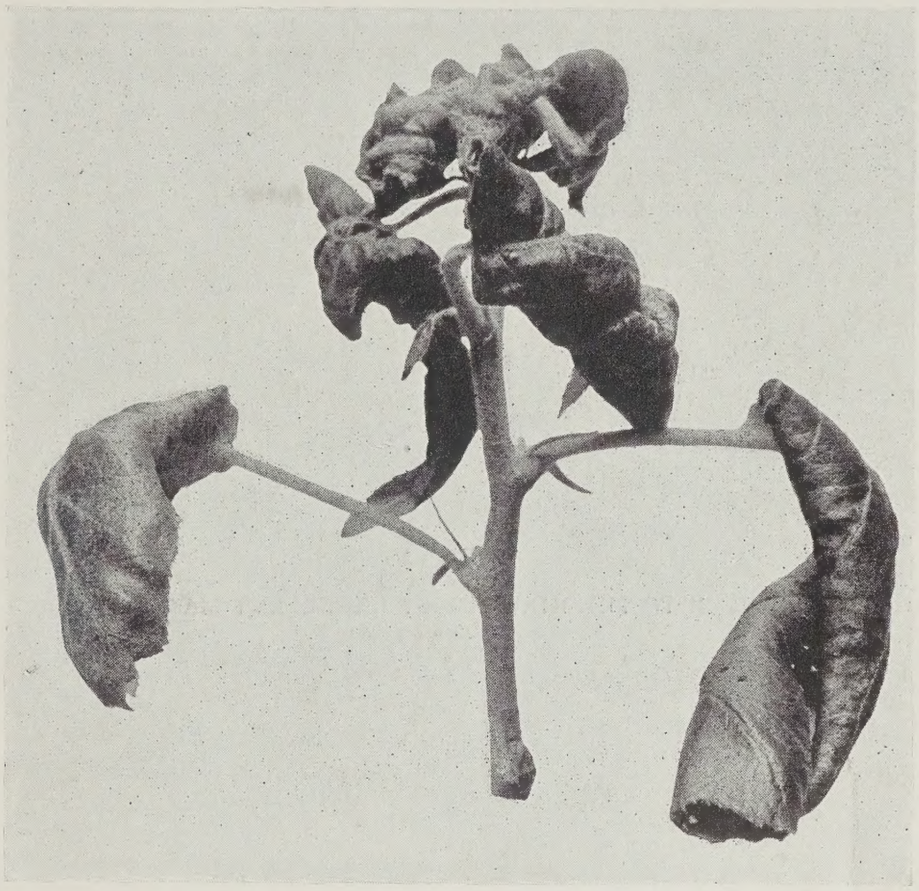

Leaves tightly curled by aphids. (Author's illustration)

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APHIDS OR PLANT LICE

By W. A. Ross, Entomological Laboratory, Vineland Station, Ontario

Aphids, or plant lice, are the small soft-bodied, winged or wingless insects commonly found clustering, usually in dense colonies, on almost all kinds of plants. Most of our common species are green; others again are reddish, brown or black; and some kinds are covered with a white powdery or woolly material. They are insignificant in appearance, but because of their tremendous powers of multiplication they are capable of inflicting serious losses to important greenhouse, orchard, garden and field crops.

Aphids clustering on sweet cherry. (Author's illustration)

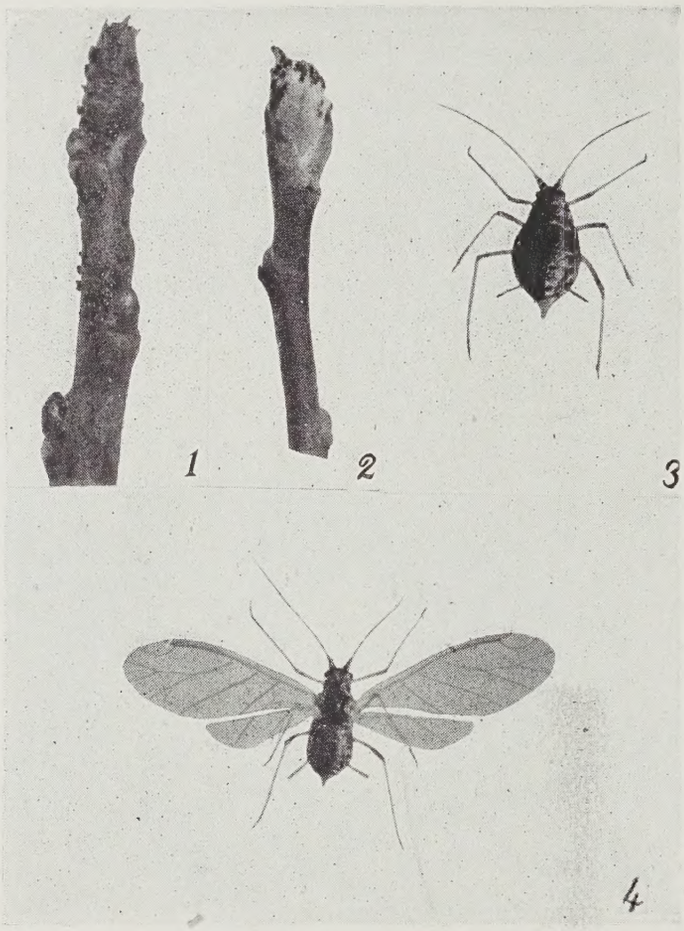
Nature of Injury

Aphids commonly attack the foliage and tender growth of plants, but they may also be found infesting blossoms, fruit, roots and bark. They thrust their sharp sucking mouthparts into the plant tissues, and drain out the sap or life-juices. Their feeding activities result in injuries varying in degree from curling of the leaves to the complete destruction of the plant. Severe infestations of aphids stunt the growth of shrubs and trees; dwarf, deform and stain fruit; make ornamentals and other plants unsightly by twisting and smutting the leaves and by injuring the flowers; and check the growth of or destroy garden and field crops. The smutting or staining of fruit and leaves, referred to above, is due to a sooty fungus which grows on the honeydew, a sweetish liquid excreted by the aphids.

In addition to the direct damage they cause vegetation, aphids are also responsible to a large extent for the transmission of several serious plant diseases such as raspberry mosaic, potato mosaic, and potato leaf curl.

Life Cycle

Commencing with the eggs, which are deposited on the food plants in autumn and which hatch in spring about the time vegetation is reviving, a typical aphid life-cycle is as follows: All the insects which hatch from the winter eggs develop into wingless females. The first generation is then rapidly



1, Aphid eggs on a twig; 2, recently hatched aphids on an opening bud; 3, wingless aphid; 4, winged aphid; 3 and 4, much enlarged.
(Author's illustration)

succeeded by brood after brood of winged and wingless plant lice until by fall as many as thirteen or fourteen generations may have arisen. All the spring and summer forms are females which, without the intervention of a male, give birth to living young. As the summer forms may commence to reproduce seven to ten days after birth and as each female may produce over fifty young, it is not at all surprising that frequently the plant lice become so numerous that it is almost impossible to insert a pin into the infested portion of a plant without touching an insect. In the fall, true males and females appear and after pairing the females deposit the winter eggs.

Many species of aphids have the peculiar habit of abruptly changing their food plants. For example, the rosy apple aphis by means of winged forms deserts the apple during early summer and migrates to plantains, on which hosts the species feeds and breeds. In the fall the return migration to apple takes place.

Control of Plant Lice

Stomach poisons such as arsenate of lead, arsenate of lime and Paris green are wholly ineffective against plant lice. These insects can only be destroyed by the application of spray preparations which kill by contact, and in view of the fact that these materials kill only by contact, it is essential, in applying them, to coat all or practically all of the insects with the spray.

Among the best contact insecticides for aphis control are:—

Nicotine Sulphate.—Nicotine sulphate (40 per cent) preparations are sold by insecticide dealers and by nearly all seedsmen. They may be used in combination with any of our garden or orchard sprays. When used alone, soap should be added at the rate of 2 pounds in 40-50 gallons or 1 ounce in 1 gallon of spray. The soap should be dissolved, of course, in boiling water.

Commercial Nicotine Dusts.—Contact dust preparations, made by impregnating hydrated lime or some other superfine material with nicotine, are sold by different commercial concerns for combating aphids and other sucking insects. These dry mixtures are applied by means of dusting machines, several types of which, ranging from small hand dusters to large power outfits, are available. To be most effective nicotine dusts should be applied under calm, warm conditions.

Woolly aphis on apple. (Author's illustration)

Home-made Nicotine Dust.—A satisfactory contact dust may be made by mixing $2\frac{1}{2}$ pounds of nicotine sulphate (40 per cent) with 47 pounds of hydrated lime in a mixer consisting of a tight barrel placed horizontally on a stand so that it may be revolved by hand. In the side of the barrel a hole about six inches square is cut and a hinged lid attached. The requisite quantity of lime is placed in the barrel and the nicotine sulphate is poured over the lime. A few stones about the size of golf balls should also be put in the barrel to prevent the lime from caking and to ensure even mixing. The barrel should then be revolved for about five minutes until the nicotine is thoroughly mixed. The dust may then be poured directly into the duster or into air-tight cans. The stones may be removed by pouring the dust through wire netting.

Whale Oil Soap.—This must be dissolved in boiling water. For greenish aphids, it should be used in the strength of 1 pound to 6 gallons of water; for brown or black aphids, a 1 to 4 solution should be used.

BRIEF DIRECTIONS FOR THE CONTROL OF PLANT LICE UNDER GREENHOUSE, GARDEN AND FIELD CONDITIONS

Greenhouse Plants

The general practice should be to spray with a nicotine preparation when only a few plants are attacked, and to fumigate with hydrocyanic acid gas* or nicotine (liquids or papers) where most or all of the house is infested. In using the commercial nicotine preparations, the manufacturer's directions should be followed.

Violets are very susceptible to injury from nicotine fumigation and nicotine sprays, and for this reason hydrocyanic acid gas should be used for the control of the black violet aphis.

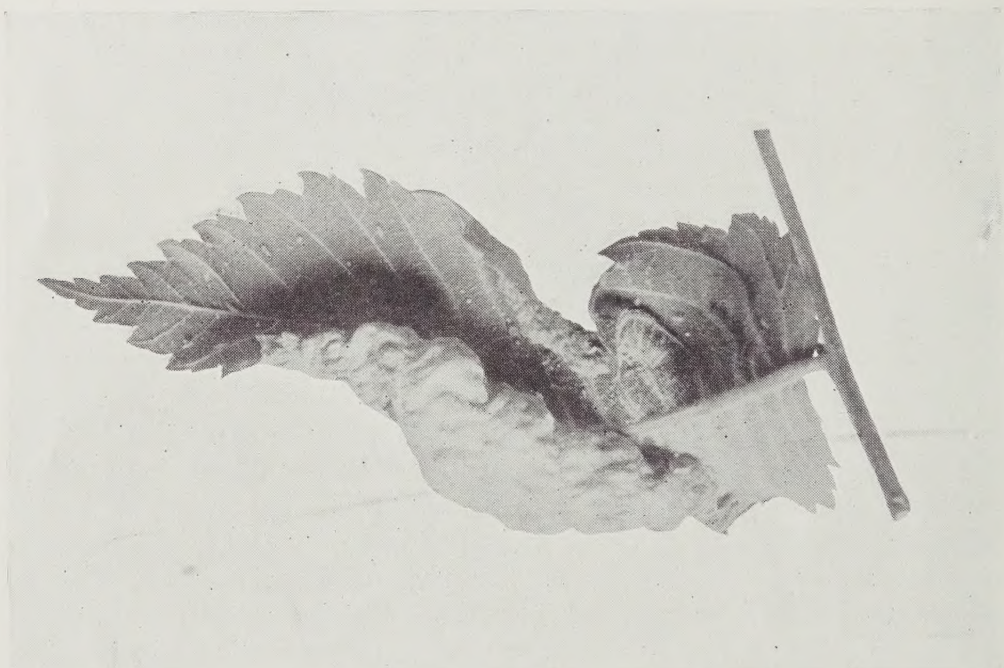
Truck Crops

Spray as soon as the aphids are in evidence with $\frac{3}{8}$ pint nicotine sulphate and 2 pounds of soap in 40 gallons of water. Take great pains to drench undersides of leaves. In place of the liquid spray a contact dust containing not less than 2 per cent nicotine may be used, and is to be preferred where it is difficult to hit the aphids with a spray. The dust should be applied under warm, still, atmospheric conditions, as it is liable to be ineffective on cool or windy days.

Field Crops

In districts where plant lice are destructive to peas, early sowing should be practised, and only early maturing varieties should be grown. Early peas are rarely injured by plant lice.

Apart from the suppression of volunteer growth in the fall no special effort need be made to control grain aphids. In Canada, grain crops are rarely seriously injured by aphids.



Elm leaf distorted by plant lice. (Author's illustration)

Orchard Trees

In orchards where the rosy aphis is troublesome nearly every year, spray when the fruit buds are on the point of bursting with $\frac{3}{8}$ pint nicotine sulphate in 40 gallons lime sulphur. In order to obtain satisfactory results from this

*Hydrocyanic acid gas may be generated by using calcium cyanide according to the manufacturer's directions or by using the "pot method" described in Bulletin No. 7—New Series. Dom. Dept. Agr., pp. 7-10.

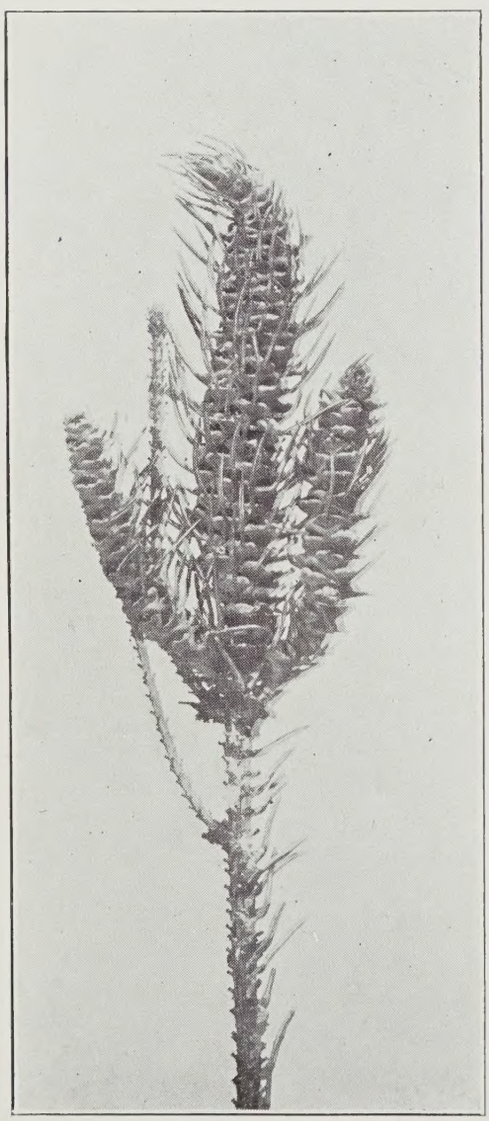
application, it is essential to use good pressure and liberal amounts of material. Each tree, before passing on to the next, should be sprayed from all angles so that the leeward and under sides of the buds will be as well coated as the windward and upper sides. If the green apple aphis at any time of the season becomes abundant, thoroughly spray the under sides of the leaves with $\frac{3}{8}$ pint of nicotine sulphate and 2 pounds of soap in 40 gallons of water, or where a power duster is available apply nicotine dust. Also cease cultivation at once with the object of hardening the succulent growth on which the aphis thrives.

For the control of the black cherry aphis, sweet cherry orchards should be sprayed annually, just as the buds are on the point of bursting, with $\frac{1}{2}$ pint nicotine sulphate in 40 gallons of lime sulphur or with a 3 per cent oil emulsion.* A valuable supplementary measure is to remove and destroy, in June, any infested water sprouts which may be found.

Plum and peach trees need not be sprayed or dusted with nicotine until the aphids are in evidence.

Bush Fruits

For the control of currant aphids, apply nicotine ($\frac{3}{8}$ pint to 40 gallons of spray) as the leaf buds are opening. It is advisable to combine the nicotine with Bordeaux mixture or, in sections where San Jose scale is present, with lime sulphur. For later applications use nicotine dust or apply a nicotine-soap spray with angle nozzles in order to thoroughly wet the undersides of the leaves.



Galls on spruce caused by plant lice. (After Swaine)

*The method of preparing a home-made lubricating oil emulsion is outlined in circular No. 37—Dom. Dept. Agr.

Spray with $\frac{3}{8}$ pint nicotine sulphate, and 2 pounds soap in 40 gallons of water, or use nicotine dust as soon as the aphids appear and before the leaves become curled. For the control of species, such as the viburnum or snowball aphis, which curl the foliage tightly, the spray must be applied at the time the buds are commencing to burst.

Spruce trees infested with the gall louse should be sprayed some time before the latter part of April with commercial lime sulphur, 1 gallon to 9 gallons of water (1·030 sp. gr.) or preferably with 15 per cent kerosene emulsion.*

On poplars, the vagabond gall louse produces peculiar flattened, convoluted sack-like galls about 2 inches in diameter, which dry out and turn black at the close of the season. It is believed that this gall louse may be controlled by removing the old galls during the winter and early spring.

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*Kerosene	2 gallons
Water	1 gallon
Soap	$\frac{1}{2}$ pound

Dissolve the soap in boiling water, add the kerosene and then pump the mixture back into itself until it becomes a creamy mass. Add $10\frac{1}{2}$ gallons of water to 3 gallons of stock emulsion to make a 15 per cent spray.